Monday, November 21st

Reminder: Quiz tomorrow on Sections 5.2 to 5.5

- Review Section 5.4 (discrete and continuous data...and graphing data)
- Finish, Check, and go over questions Pg.286 #1,2
- Begin Section 5.5 (what is the domain/range read from a graph and is the graph considered to be a function).

Quiz on Tuesday on Sections 5.2 to 5.5

5.5 Graphs of Relations and Functions

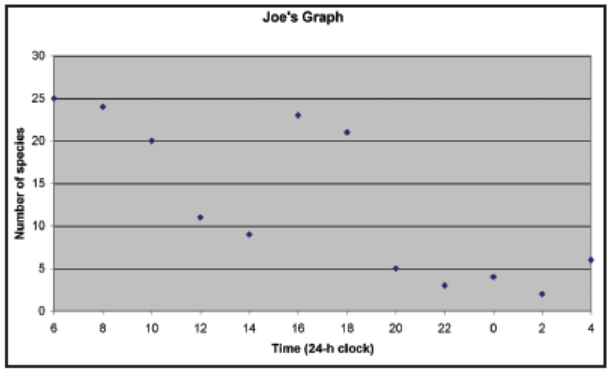
LESSON FOCUS | Determine the properties of the graphs of relations and functions.

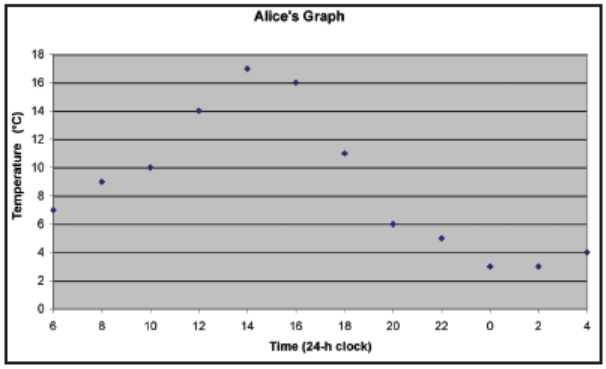
Make Connections

In an environmental study in Northern Alberta, Joe collected data on the numbers of different species of birds he heard or saw in a 1-h period every 2 h for 24 h. Alice collected data on the temperature in the area at the end of each 1-h period. They plotted their data.

Does each graph represent a relation? A function? How can you tell?

Which of these graphs should have the data points connected? Explain.





TRY THIS

Work with a partner.
You will need grid paper.

A. Each of you chooses one of these tasks:

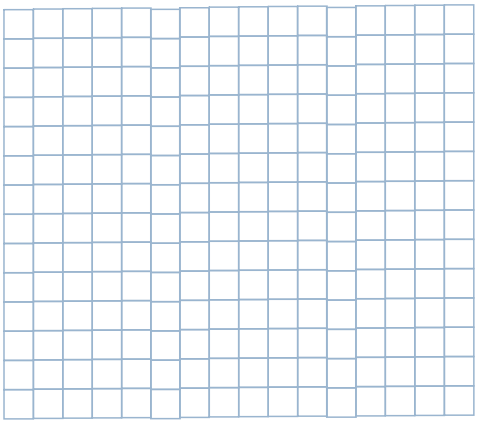
- A sugar cube has a volume of 5 cm^3 and a mass of 4 g. Graph the mass of sugar as a function of the number of sugar cubes from 0 to 5 sugar cubes.
- Five cubic centimetres of loose sugar also has a mass of 4 g. Graph the mass of sugar as a function of the volume of sugar from 0 to 25 cm^3 of loose sugar.

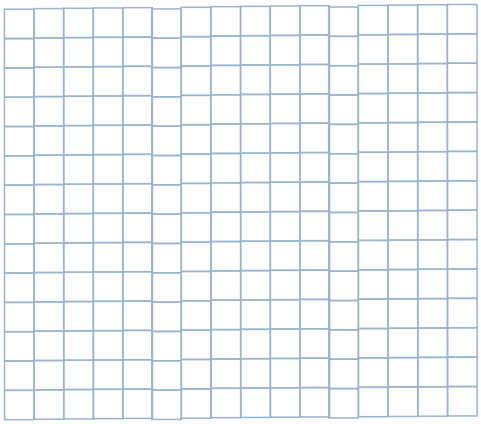
B. Share your results. How are your graphs alike? How are they different?

C. Work together:

- Identify the dependent variable and independent variable for each function. How did you decide on which axis to graph each variable?
- How did you decide whether to connect the points?
- Are there any restrictions on the domain and range? Explain.

- A sugar cube has a volume of 5 cm^3 and a mass of 4 g. Graph the mass of sugar as a function of the number of sugar cubes from 0 to 5 sugar cubes.
- Five cubic centimetres of loose sugar also has a mass of 4 g. Graph the mass of sugar as a function of the volume of sugar from 0 to 25 cm^3 of loose sugar.





How are the graphs alike? How are they different?

Identify the dependent variable and independent variable for each function. How did you decide on which axis to graph each variable?

How did you decide whether to connect the points?

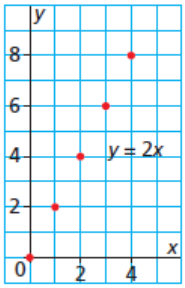
Are there any restrictions on the domain and range? Explain.

We can represent the function that associates every whole number with its double in several ways.
Using a table of values:

Whole Number, x	Double the Number, y
0	0
1	2
2	4
3	6
4	8

The table continues for all whole numbers.
The domain is ?
The range is ?

Using a graph:



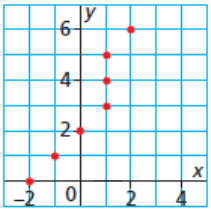
We know the relation $y = 2x$ is a function because each value of x associates with exactly one value of y, and each ordered pair has a different first element.

The *domain* of a function is the set of values of the independent variable; for the graph above, the domain is ?

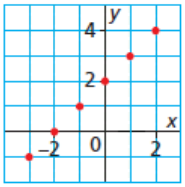
The *range* of a function is the set of values of the dependent variable; for the graph above, the range is ?

When the domain is restricted to a set of discrete values, the points on the graph are not connected.

A relation that is not a function has two or more ordered pairs with the same first coordinate. So, when the ordered pairs of the relation are plotted on a grid, a vertical line can be drawn to pass through more than one point.



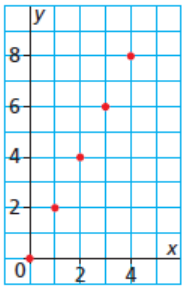
A function has ordered pairs with different first coordinates. So, when the ordered pairs of the function are plotted on a grid, any vertical line drawn will always pass through no more than one point.

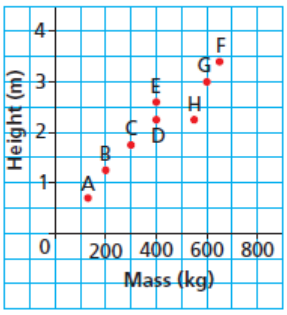


*

Vertical Line Test for a Function

A graph represents a function when no two points on the graph lie on the same vertical line.
Place a ruler vertically on a graph, then slide the ruler across the graph. If one edge of the ruler always intersects the graph at no more than one point, the graph represents a function.





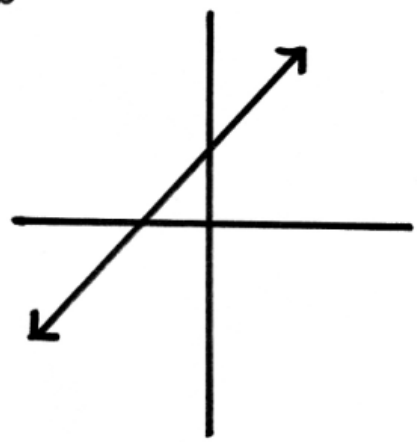
Before we begin....A Reminder:

Domain - All the possible x values
Range - All of the possible y values

We will be talking about 3 different types of functions:

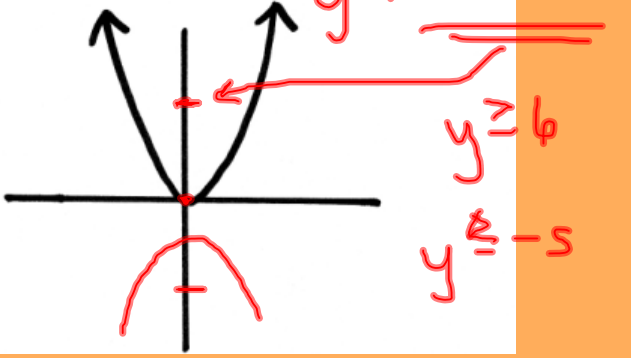
Linear Function: $y = mx + b$

Domain: $x \in R$
Range: $y \in R$



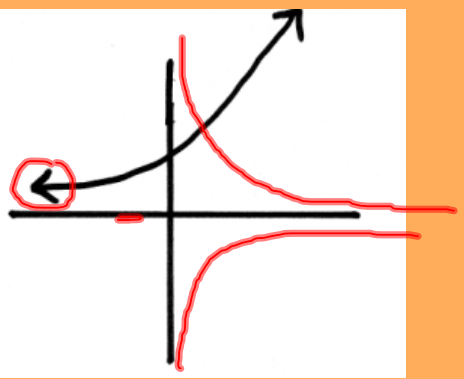
Quadratic Function: $y = ax^2 + bx + c$

Domain: $x \in R$
Range: $y \geq 0$



Exponential Function: $y = a^x$

Domain: $x \in R$
Range: $y \neq 0$



(1, 2) (3, 4) (5, 1) (2, 8) (3, -2)

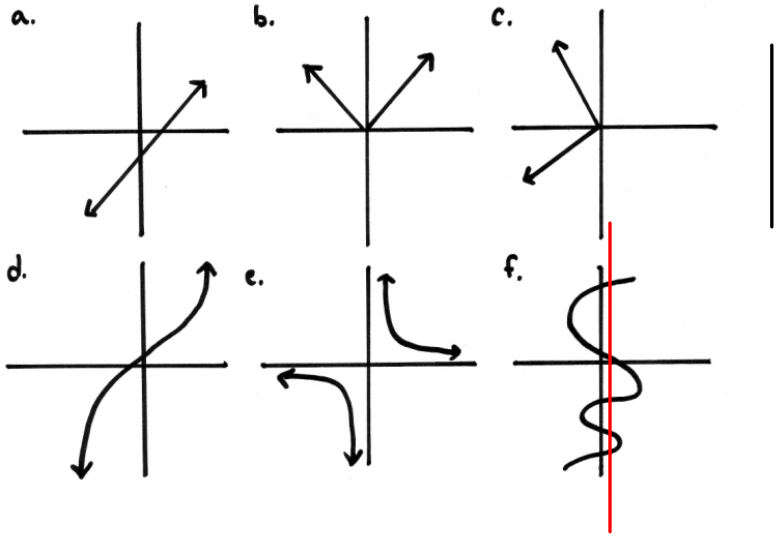
Section 5.5

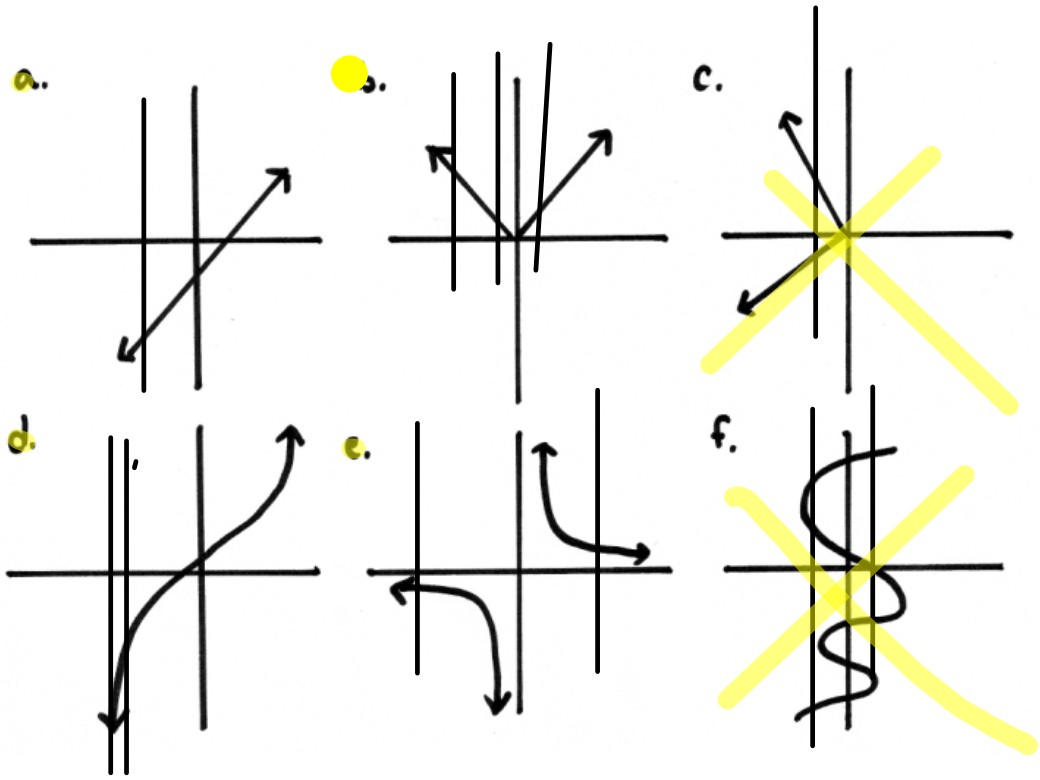
A **vertical line test** helps us determine if a graph is a function or not.

Remember, a function has only one y value for every x value.

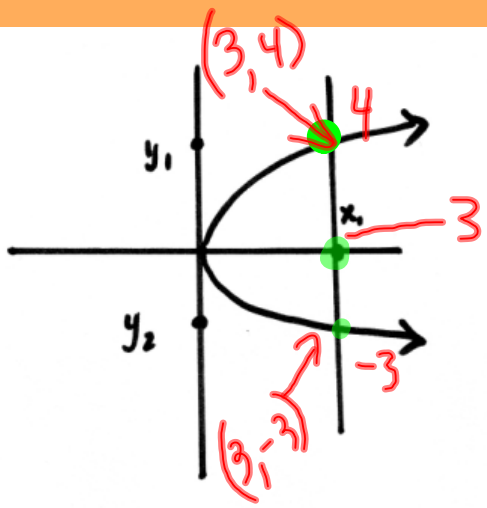
If a graph **is** a function, when we draw a vertical line through it, it will only intersect the graph once.

Which of the following are functions?





A function is a relationship where for every x value there is only one y value.



Not a function !

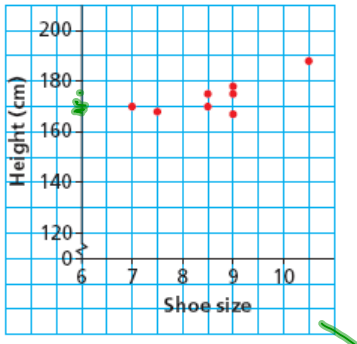
There are two y values for one x value.

Example 1 Identifying whether a Graph Represents a Function

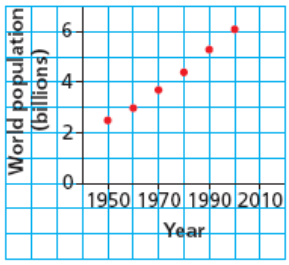
Pg. 290

Which of these graphs represents a function? Justify the answer.

a) Height against Shoe Size



b) World Population



CHECK YOUR UNDERSTANDING

SOLUTION

Domain (x-values) (7, 7.5, 8.5, 9, 10.5)

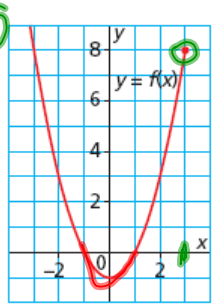
Range (y-values) (167, 169, 170, 175, 178, 188)

Example 2 Determining the Domain and Range of the Graph of a Function

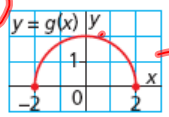
Pg. 291

Determine the domain and range of the graph of each function.

a)



b)



Domain $-2 \leq x \leq 2$

Range $0 \leq y \leq 2$

CHECK YOUR UNDERSTANDING

SOLUTION

Domain (x-values) $(x \leq 3)$

Range (y-value) $(y \geq -1)$

→ Finish Pg. 286 #1 ✓, 2

→ Pg. 294 # ~~7, 8~~ 4-8

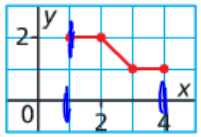
Tuesday, November 22nd

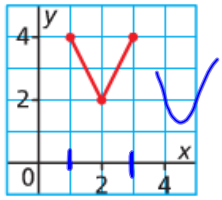
- Chapter 5 Quiz today

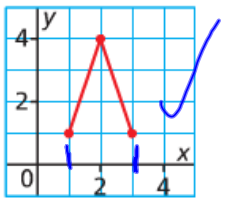
First:

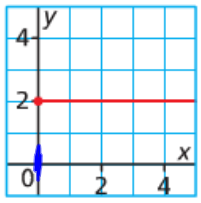
- Check and go over homework (#7,8)
- quick last-minute review of terms on quiz

7. Match the graph of each function to its domain and range listed below.

a) 

b) 

c) 

d) 

i) domain: $1 \leq x \leq 3$; range: $2 \leq y \leq 4$ b

ii) domain: $1 \leq x \leq 3$; range: $1 \leq y \leq 4$ C

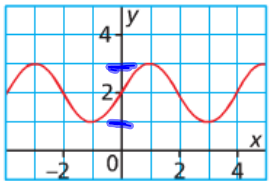
iii) domain: $x \geq 0$; range: $y = 2$ D

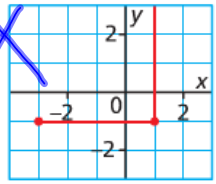
iv) domain: $1 \leq x \leq 4$; range: $1 \leq y \leq 2$ A

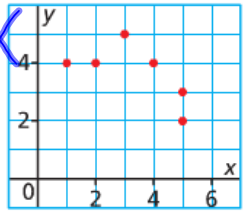
8. Which of these graphs represents a function? Justify your answer.
Write the domain and range for each graph.

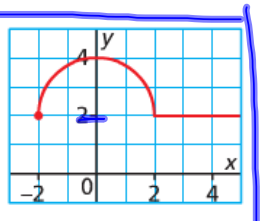
(a) D: All numbers
R: $1 \leq y \leq 3$

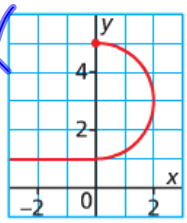
(d) D: $x \geq -2$
R: $2 \leq y \leq 4$

a) 

b) 

c) 

d) 

e) 

Review

$g = 2x + 5$

$g(x) = 2x + 5$

$g(2) = 2(2) + 5$

$= 9$

$g(2) = ?$

$g(x) = 10$

$10 = 2x + 5$

$-5 \quad -5$

$\frac{5}{2} = \frac{2x}{2}$

$x = \frac{5}{2}$ or 2.5

Review

$g = 2x + 5$ eqn.

$g(x) = 2x + 5$ func not.

$g(5) = ?$

$= 2(5) + 5$

$= 15$

$g(x) = 10$

$10 = 2x + 5$

$-5 \quad -5$

$\frac{5}{2} = \frac{2x}{2}$

$x = \frac{5}{2}$

#19 change DE to OA

#20 change CD to BC.

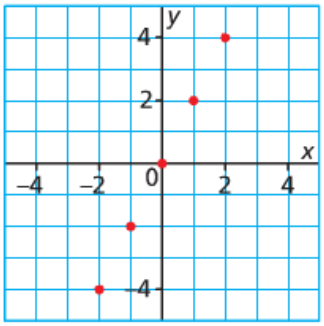
hi.

Please complete the following questions:

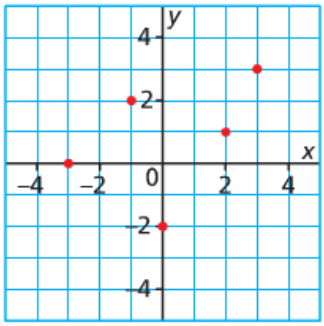
Pg. 294 # 4,5,6

4. List the domain and the range of the graph of each function.

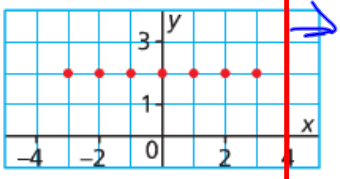
a)



b)



c)



a) Domain (x-values)
$\{-2, -1, 0, 1, 2\}$

Range
$\{-4, -2, 0, 2, 4\}$

b) D: $\{-3, -1, 0, 1, 2, 3\}$

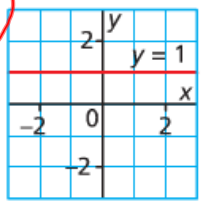
D: $\{-3, -2, -1, 0, 1, 2, 3\}$ R: $\{-2, 0, 1, 2, 3\}$

R: $y = 2$

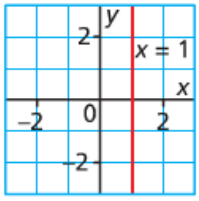
5. How can you tell that each graph in question 4 represents a function? vertical line test.

6. Which of these graphs represents a function? Justify your answer.

a)



b)



Wednesday, November 23rd

Reminder: Please come see me if you have not yet written your quiz

- Review domain/range
- Look at a couple of examples from Section 5.5
- Work on assigned questions from section 5.5 (Pg.294)

Extra help at the beginning of lunch (11:50 to 12:15)

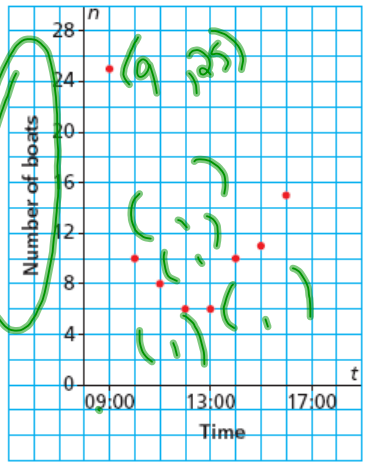
Example 3 Determining the Domain and Range of the Graph of a Situation

This graph shows the number of fishing boats, n, anchored in an inlet in the Queen Charlotte Islands as a function of time, t.

a) Identify the dependent variable and the independent variable. Justify the choices.

b) Why are the points on the graph not connected? Explain.

c) Determine the domain and range of the graph.



CHECK YOUR UNDERSTANDING

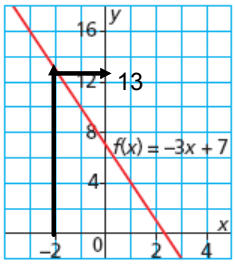
SOLUTION

Example 4 Determining Domain Values and Range Values from the Graph of a Function

Here is a graph of the function $f(x) = -3x + 7$.

a) Determine the range value when the domain value is -2.

b) Determine the domain value when the range value is 4.



CHECK YOUR UNDERSTANDING

SOLUTION

Example 4 Determining Domain Values and Range Values from the Graph of a Function

Here is a graph of the function $f(x) = -3x + 7$.

a) Determine the range value when the domain value is -2.

b) Determine the domain value when the range value is 4.

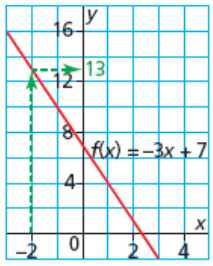
SOLUTION

The domain value is a value of x. The range value is a value of $f(x)$.

a) To determine the value of $f(x)$ when $x = -2$:

Begin at $x = -2$ on the x-axis.

Draw a vertical line to the graph, then a horizontal line to the y-axis.



The line appears to intersect the y-axis at 13.

So, $f(-2) = 13$

When the domain value is -2, the range value is 13.

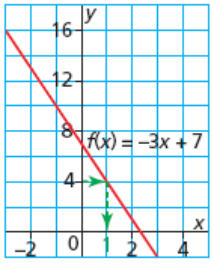
(Solution continues.)

Example 4 Determining Domain Values and Range Values from the Graph of a Function

b) To determine the value of x when $f(x) = 4$:

Since $y = f(x)$, begin at $y = 4$ on the y-axis.

Draw a horizontal line to the graph, then a vertical line to the x-axis.



The line intersects the x-axis at 1.

So, when $f(x) = 4$, $x = 1$

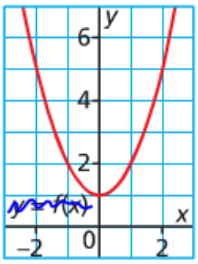
When the range value is 4, the domain value is 1.

CHECK YOUR UNDERSTANDING

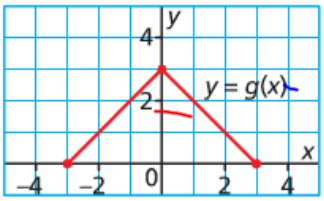
9. Determine the domain and range of the graph of each function.

Pg. 294 #9

a)



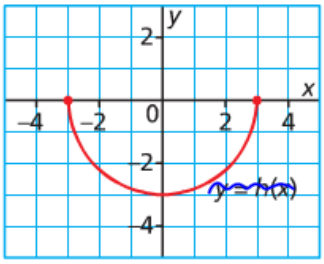
b)



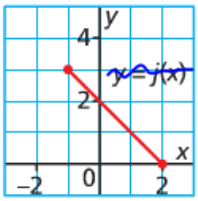
(a) Domain
all numbers

Range
$y \geq 1$

c)



d)



(b) Domain
$-3 \leq x \leq 3$

Range
$0 \leq y \leq 3$

Pg. 294-297

#9, 10, 11, 13-17, 23

Thursday, November 24th

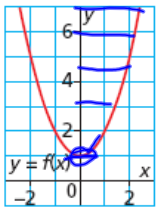
Reminder: Please come see me if you have not yet written your quiz

- Please show me your homework Pg. 294 #9,10,11,13
- Work on finishing Pg.294-296 #9,10,11,13 to 17, 23
- Notes/Examples for Section 5.6 (linear relations)

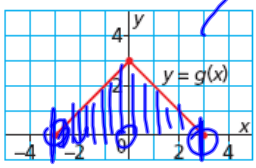
Extra help at the beginning of lunch (11:50 to 12:15)

9. Determine the domain and range of the graph of each function.

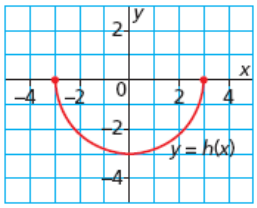
a)



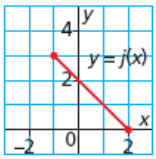
b)



c)



d)



9. a) Domain: all real numbers; range: $y \geq 1$
   b) Domain: $-3 \leq x \leq 3$; range: $0 \leq y \leq 3$
   c) Domain: $-3 \leq x \leq 3$; range: $-3 \leq y \leq 0$
   d) Domain: $-1 \leq x \leq 2$; range: $0 \leq y \leq 3$

f Relations and Functions

10. Suppose a student drew a graph of each function described below. For which graphs should the student connect the points? Justify your answers.

a) The cost of a custom-made T-shirt is a function of the number of letters on the T-shirt. NO discrete

b) The altitude of a plane is a function of the time it is in the air. Yes cont.

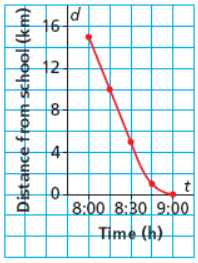
c) The mass of a baby is a function of her age. Yes

d) The cube root of a real number is a function of the number. Yes cont.

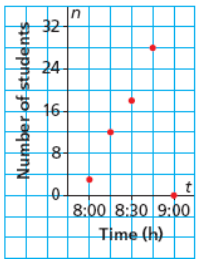
10. a) The points on the graph should not be connected.
b) The points on the graph should be connected.
c) The points on the graph should be connected.
d) The points on the graph should be connected.

11. a) What do the data in each graph represent?

i) Graph A
Distance of School Bus from School



ii) Graph B
Number of Students on a School Bus



b) Identify the independent and dependent variables.

c) Why are the points connected on one graph but not on the other?

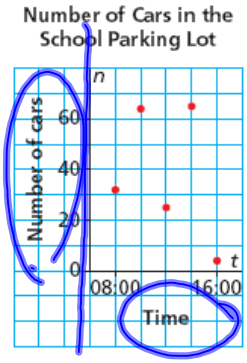
11. a) **i)** The distance of a school bus from the school from 8:00 to 9:00.
ii) The number of students on a school bus from 8:00 to 9:00.
b) **i)** Independent variable: time; dependent variable: distance from the school
ii) Independent variable: time; dependent variable: number of students
c) Graph A: points are connected because all values of time and distance are permissible between the indicated plotted points.
Graph B: points are not connected because it is impossible to have only part of a student on a bus.

13. This graph shows the number of cars, n, in the school parking lot as a function of time, t.

a) Identify the independent and dependent variables. Justify your choices.

b) Why are the points on the graph not connected?

c) Estimate the domain and range of the graph. Are there any restrictions on the domain and range? Explain.



13. a) Independent variable: t; dependent variable: n

b) The points are not connected because it is impossible to have part of a car in a parking lot.

c) Exact numbers for the range may vary. For example:
domain: {8:00, 10:00, 12:00, 14:00, 16:00};
range: {4, 25, 31, 64, 65}
Restrictions: the domain can be any time between 00:00 and 24:00, all the possible times in one day.
The range can be any whole number up to the number of parking spaces in the lot.